FIG.1

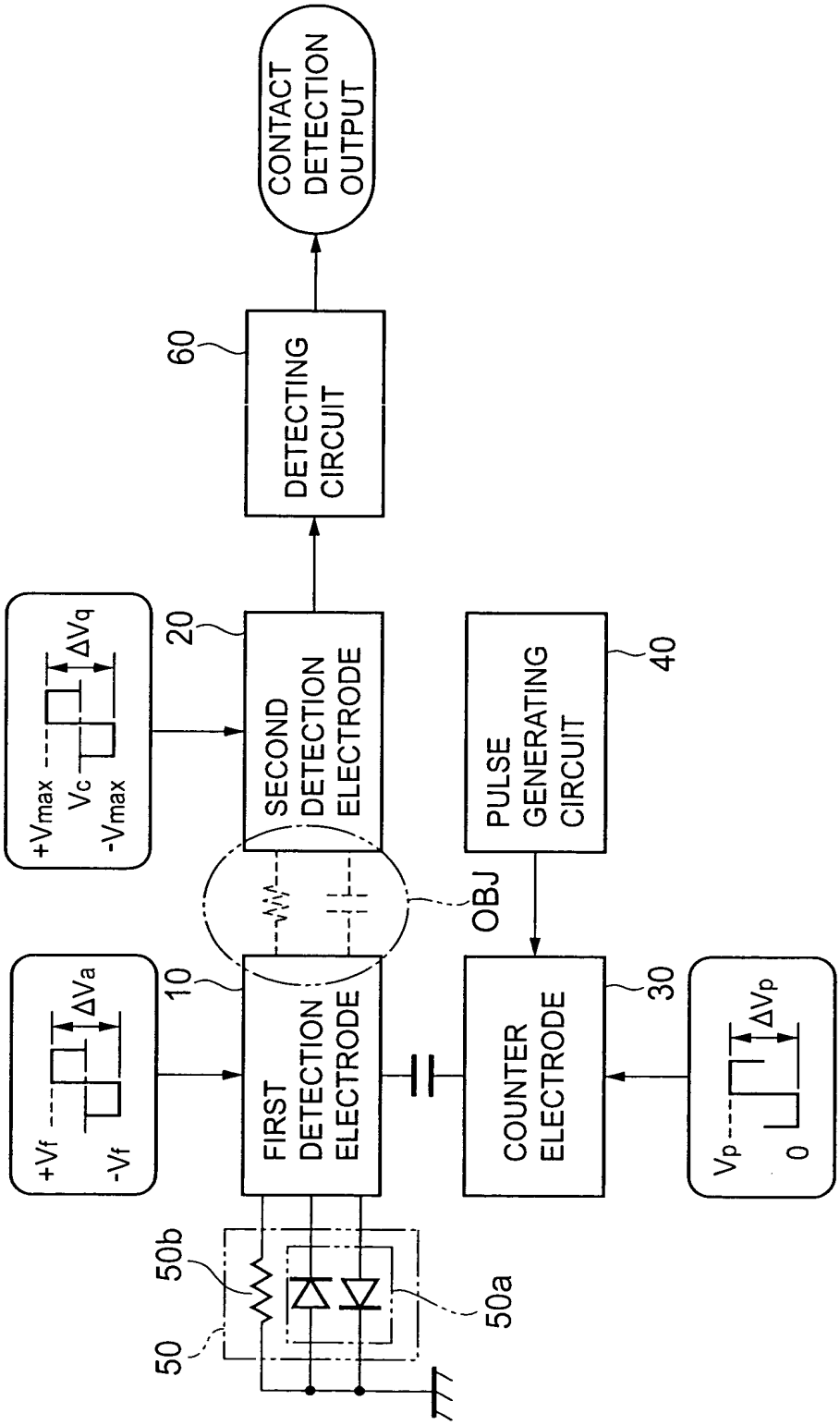

CONTACT DETECTION OUTPUT
60
DETECTING CIRCUIT
20
SECOND DETECTION ELECTRODE
+Vmax
Vc
-Vmax
ΔVq
PULSE GENERATING CIRCUIT
40
OBJ
10
FIRST DETECTION ELECTRODE
+Vf
-Vf
ΔVa
COUNTER ELECTRODE
30
Vp
0
ΔVp
50b
50
50a

FIG.2

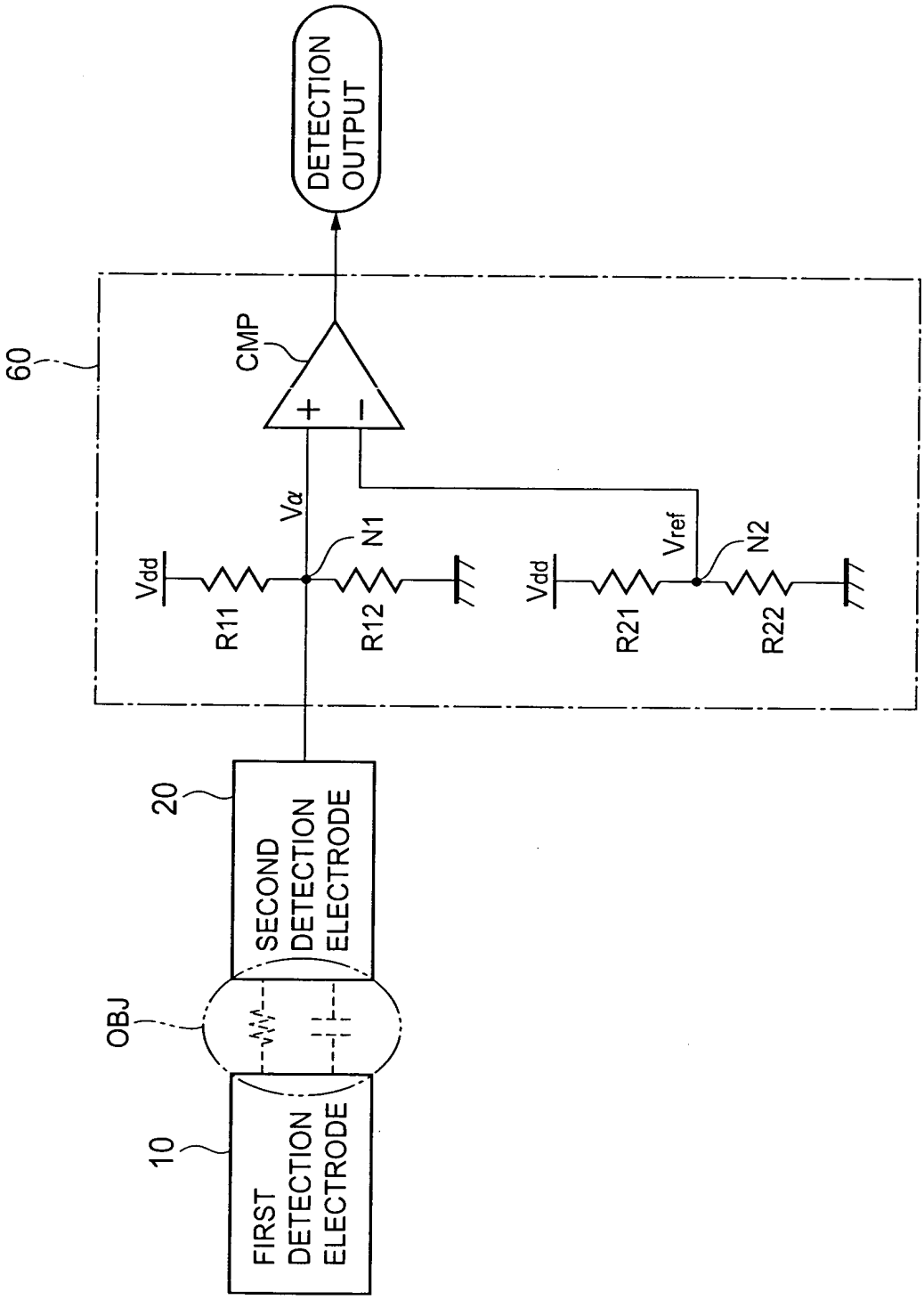

DETECTION OUTPUT
60
CMP
+
−
Vα
N1
Vdd
R11
R12
Vref
N2
Vdd
R21
R22
20
SECOND DETECTION ELECTRODE
OBJ
10
FIRST DETECTION ELECTRODE

FIG.3A

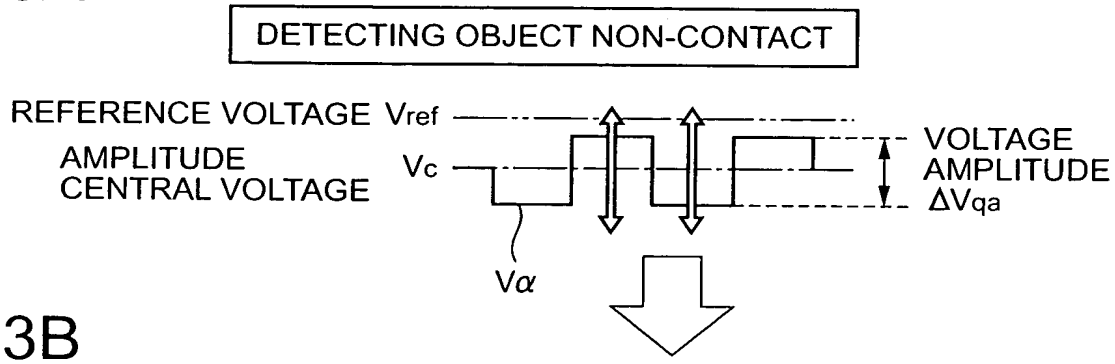


FIG.3B

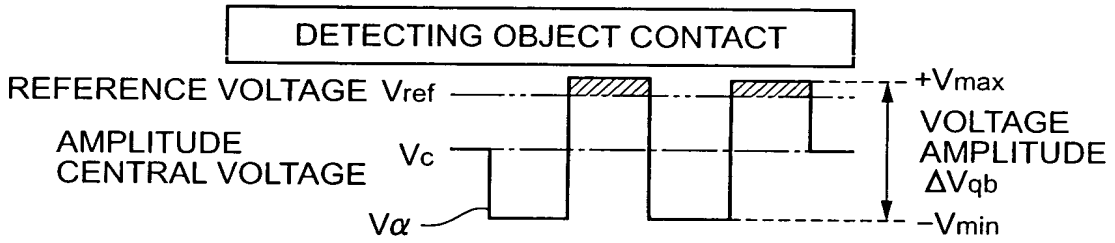


FIG.3C

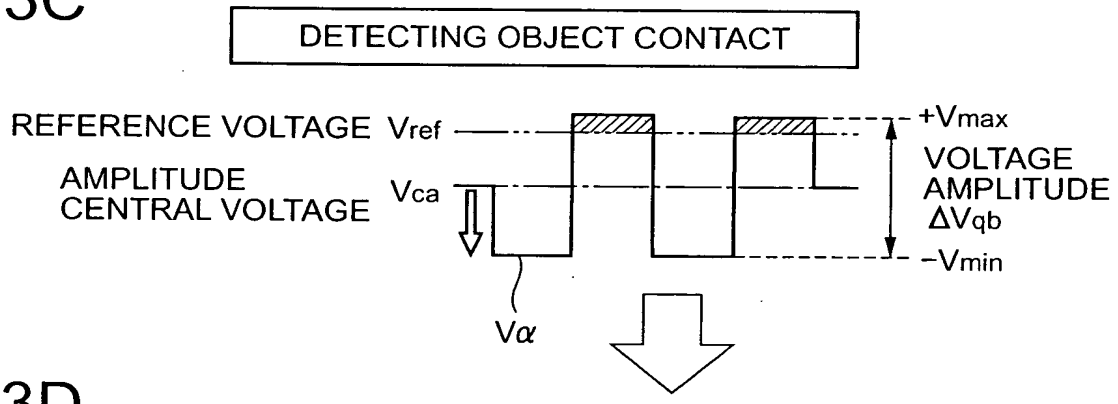


FIG.3D

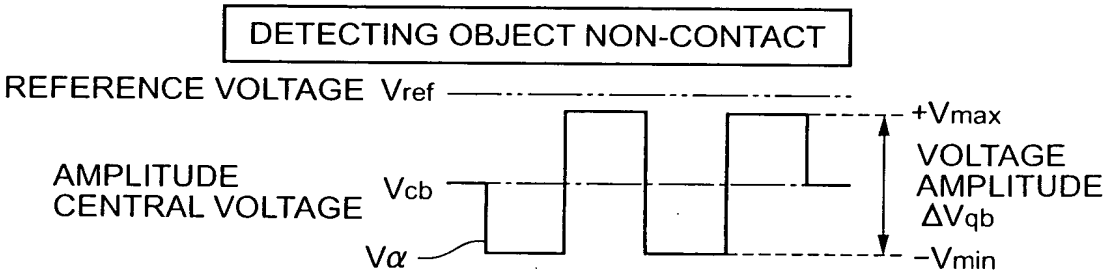


FIG.4A

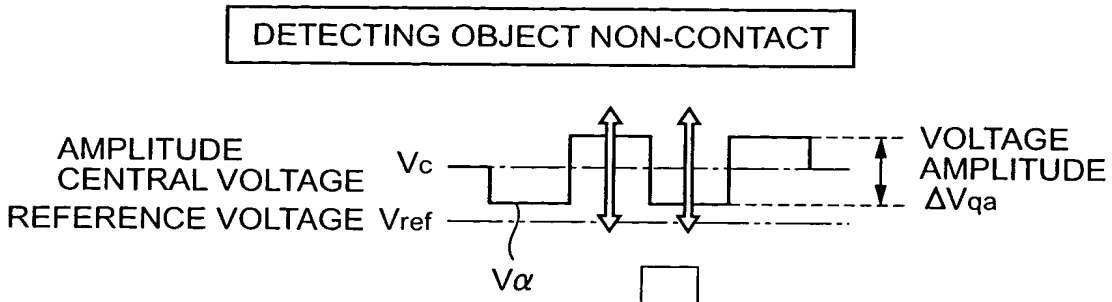


FIG.4B

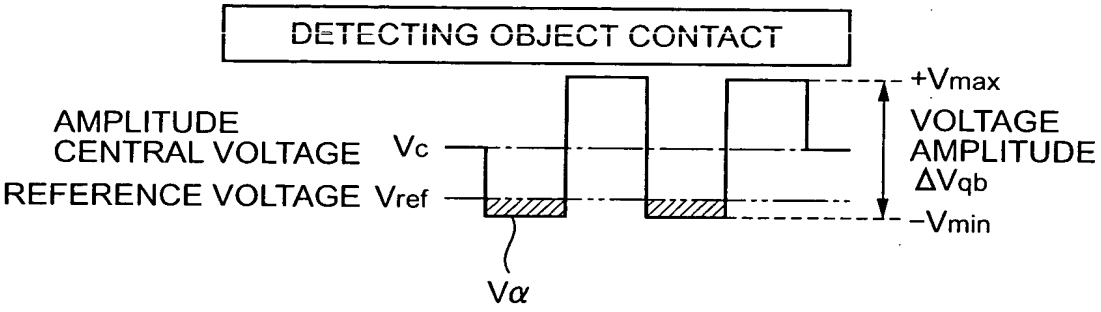


FIG.4C

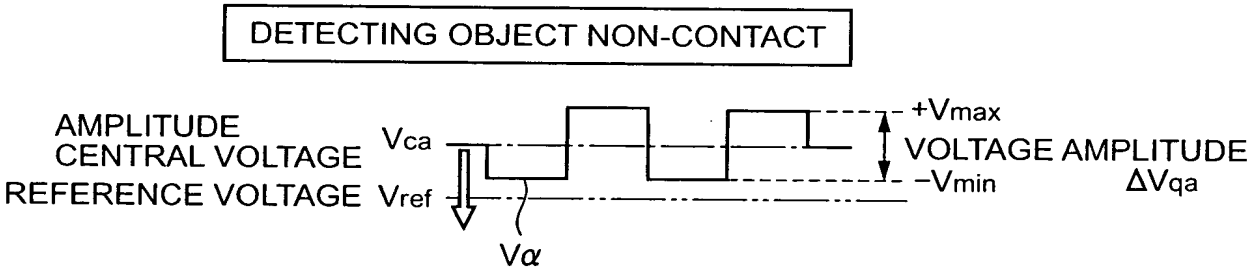


FIG.4D

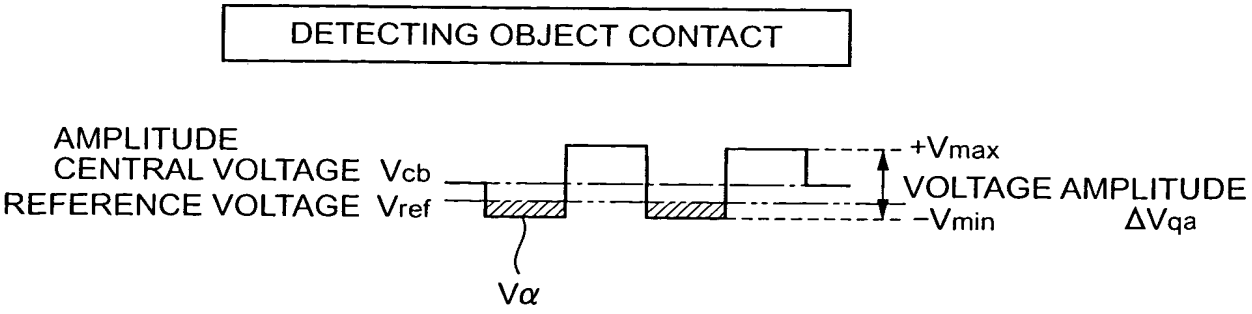


FIG.5

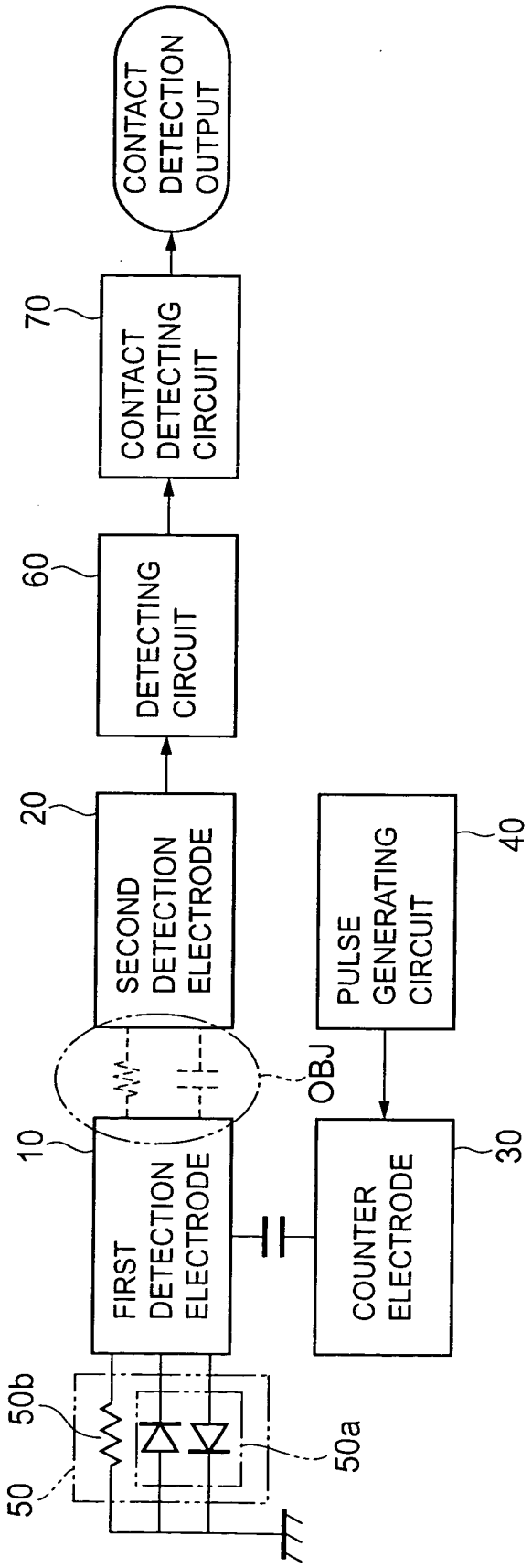

CONTACT DETECTION OUTPUT
70
CONTACT DETECTING CIRCUIT
60
DETECTING CIRCUIT
20
SECOND DETECTION ELECTRODE
PULSE GENERATING CIRCUIT
40
OBJ
10
FIRST DETECTION ELECTRODE
COUNTER ELECTRODE
30
50b
50
50a

FIG.6A

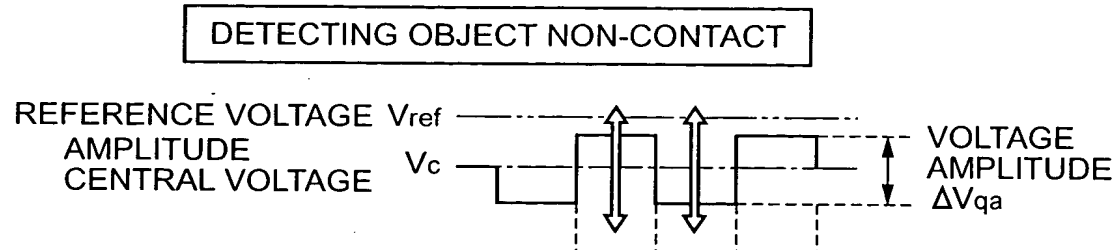


FIG.6B

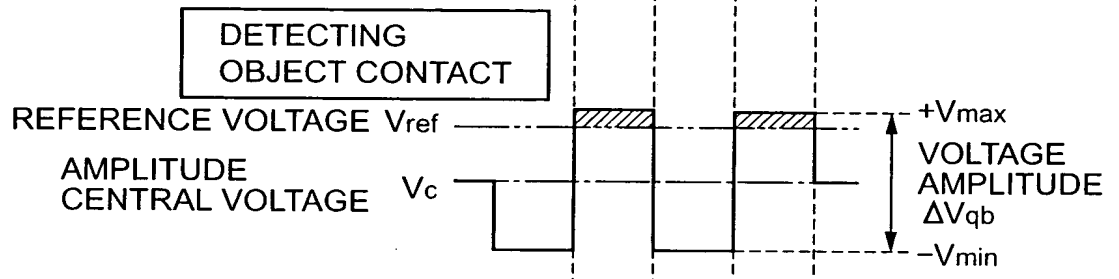


FIG.6C

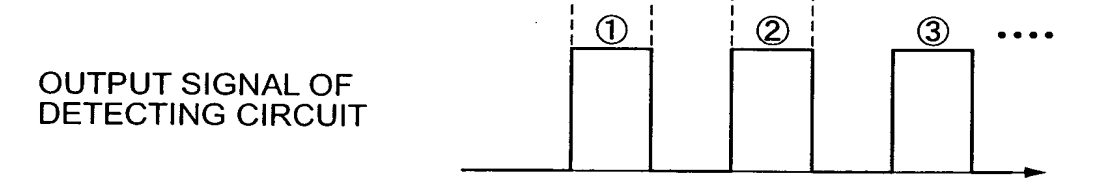


FIG.7A

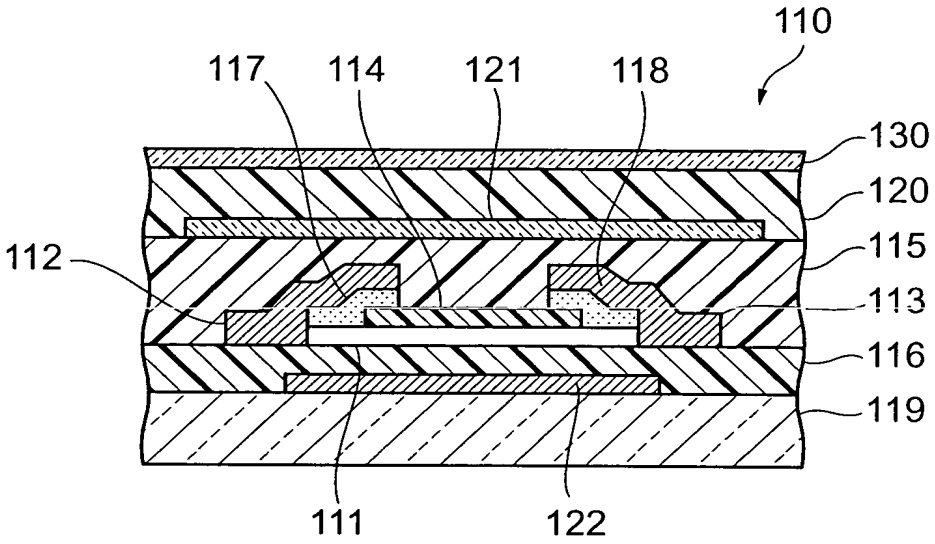


FIG.7B

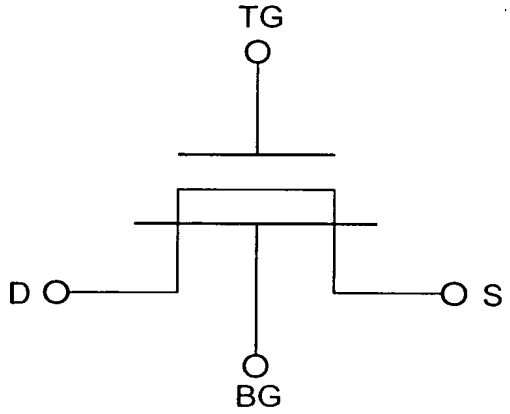


FIG.8

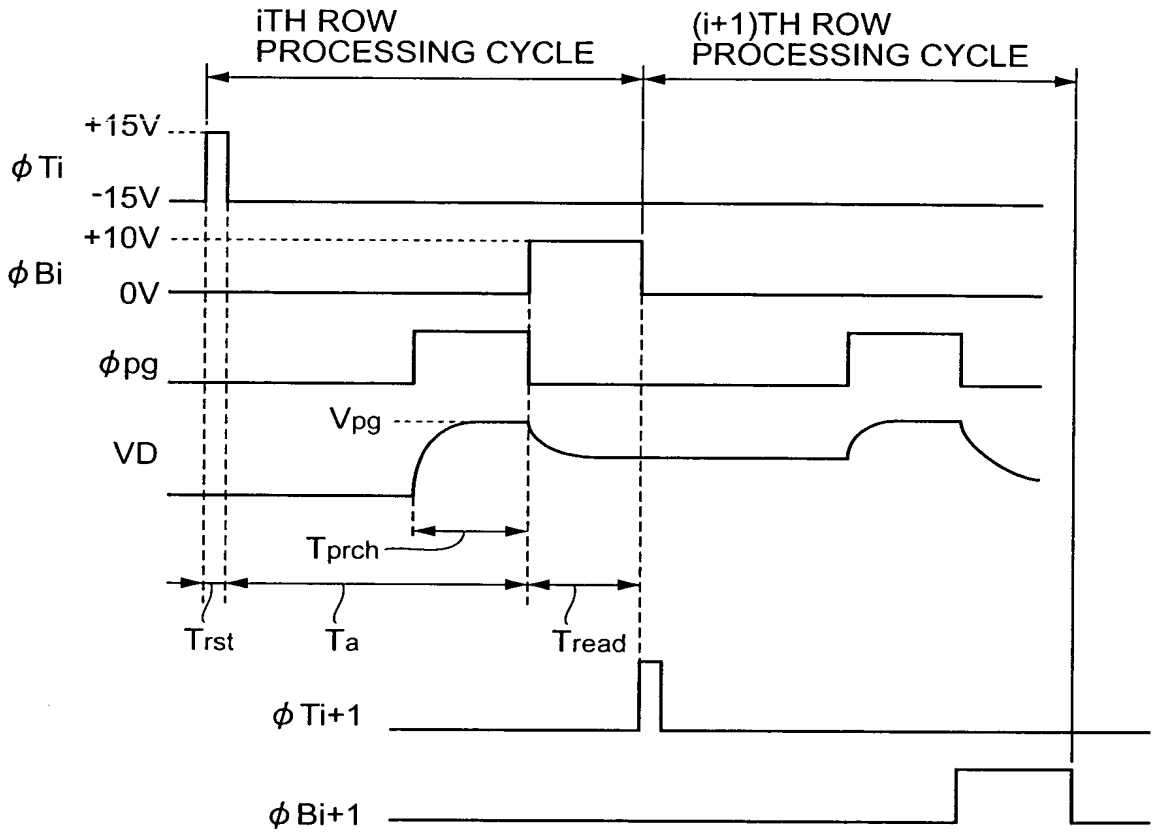

iTH ROW
PROCESSING CYCLE
(i+1)TH ROW
PROCESSING CYCLE
+15V
φTi
-15V
+10V
φBi
0V
φpg
Vpg
VD
Tprch
Trst
Ta
Tread
φTi+1
φBi+1

FIG.9

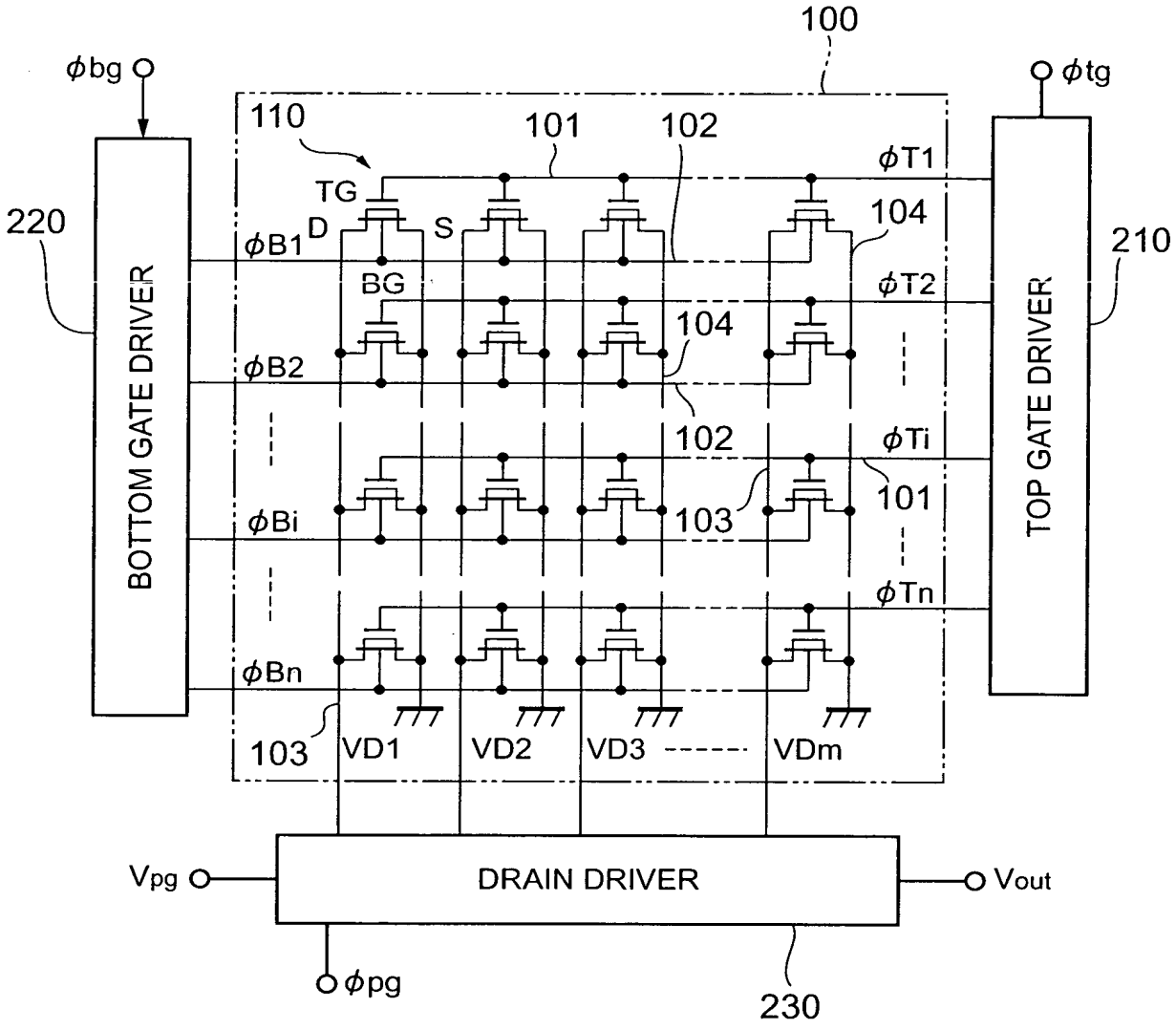

100
ϕbg
ϕtg
110
101
102
ϕT1
TG
D
S
104
220
BOTTOM GATE DRIVER
ϕB1
BG
ϕT2
210
TOP GATE DRIVER
104
ϕB2
102
ϕTi
101
ϕBi
103
ϕTn
ϕBn
103
VD1
VD2
VD3
VDm
Vpg
DRAIN DRIVER
Vout
ϕpg
230

FIG.10

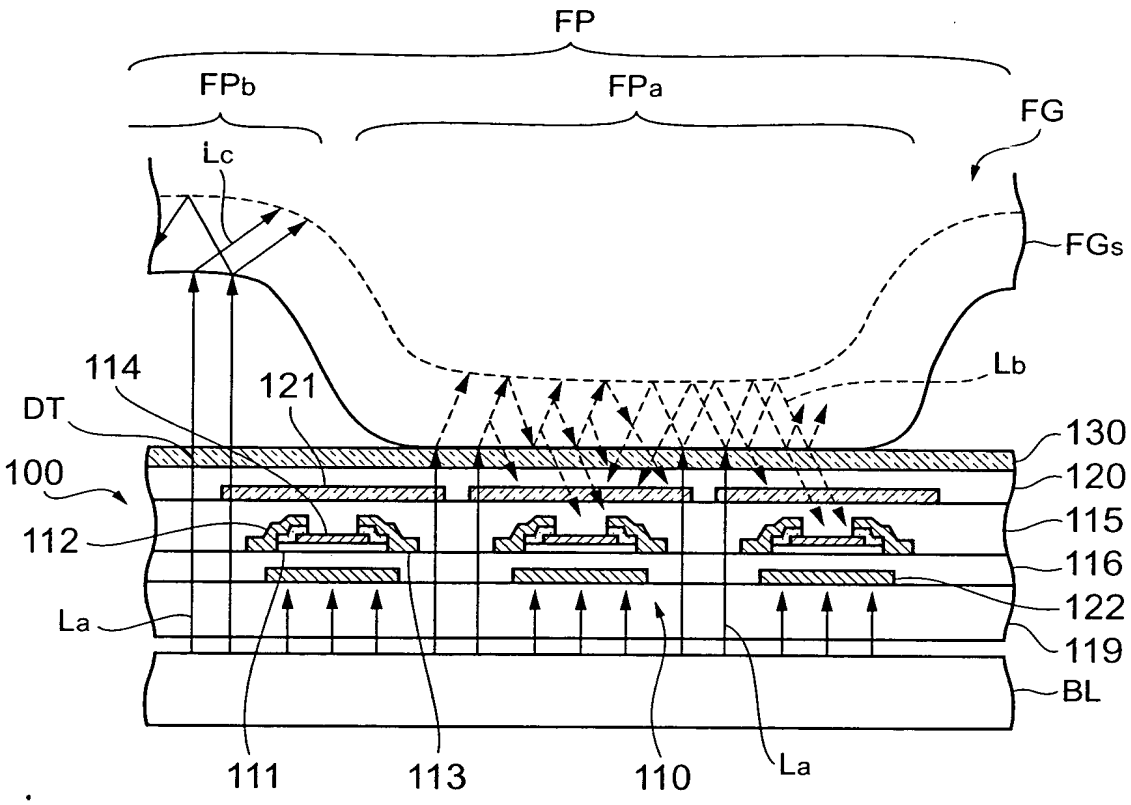

FP
FPb
FPa
FG
Lc
FGs
Lb
114
121
DT
130
100
120
112
115
116
La
122
119
BL
111
113
110
La

FIG.11A

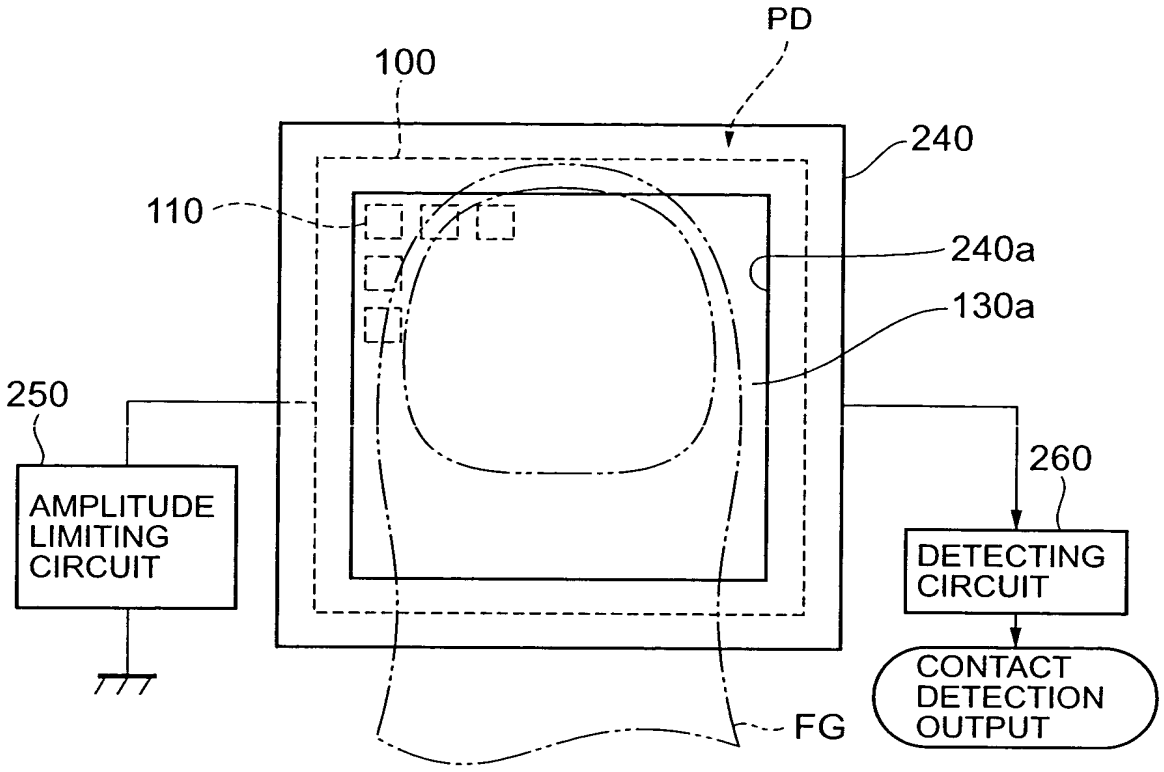


FIG.11B

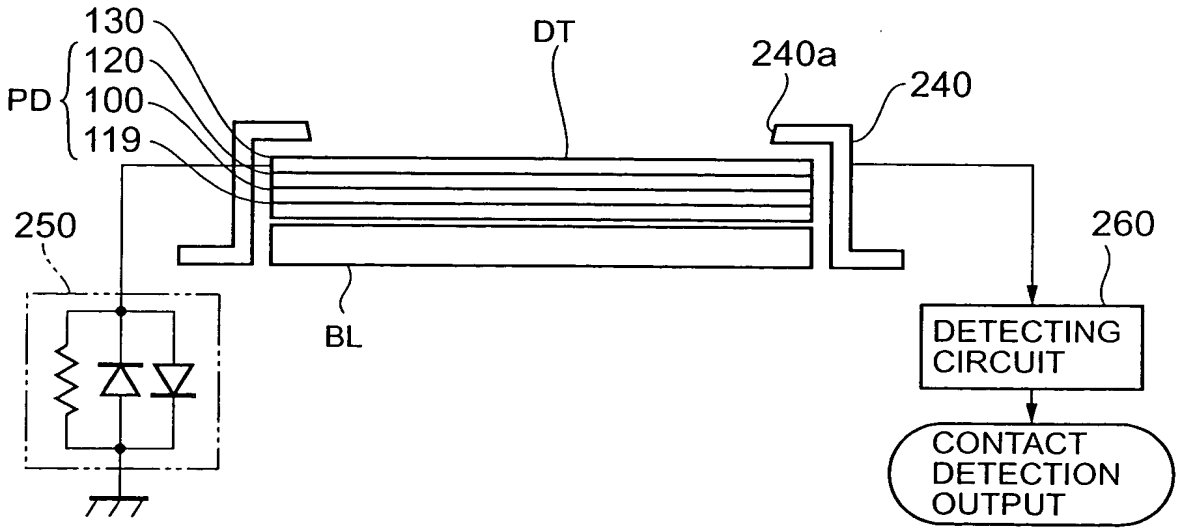


FIG.12A

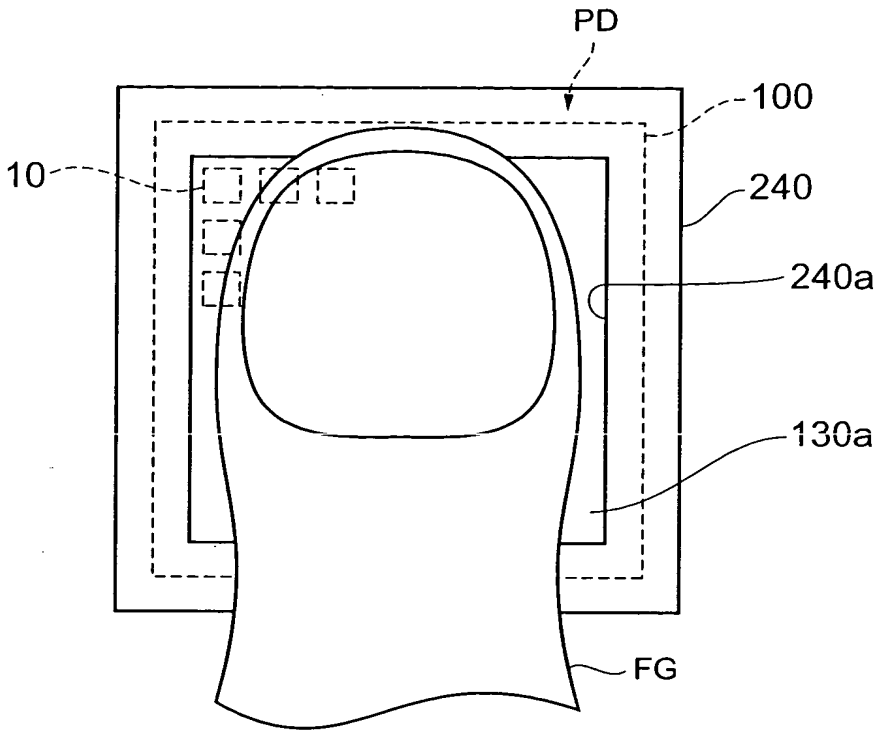


FIG.12B

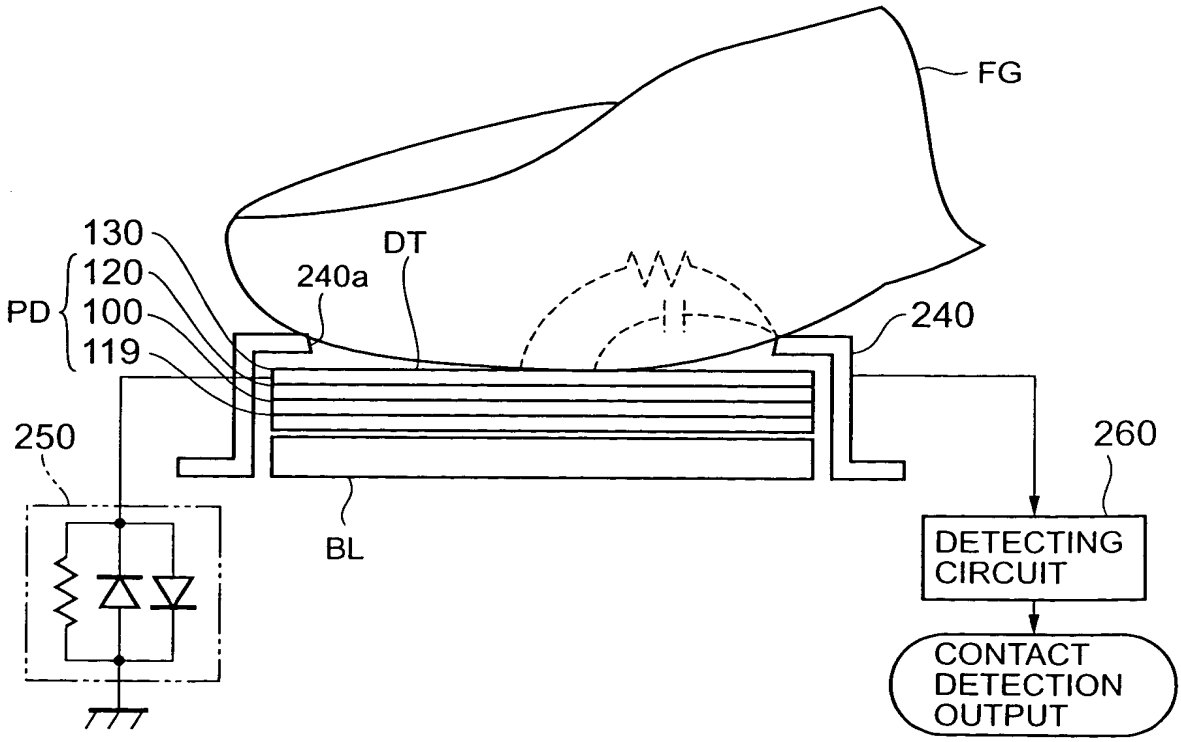


FIG.13A

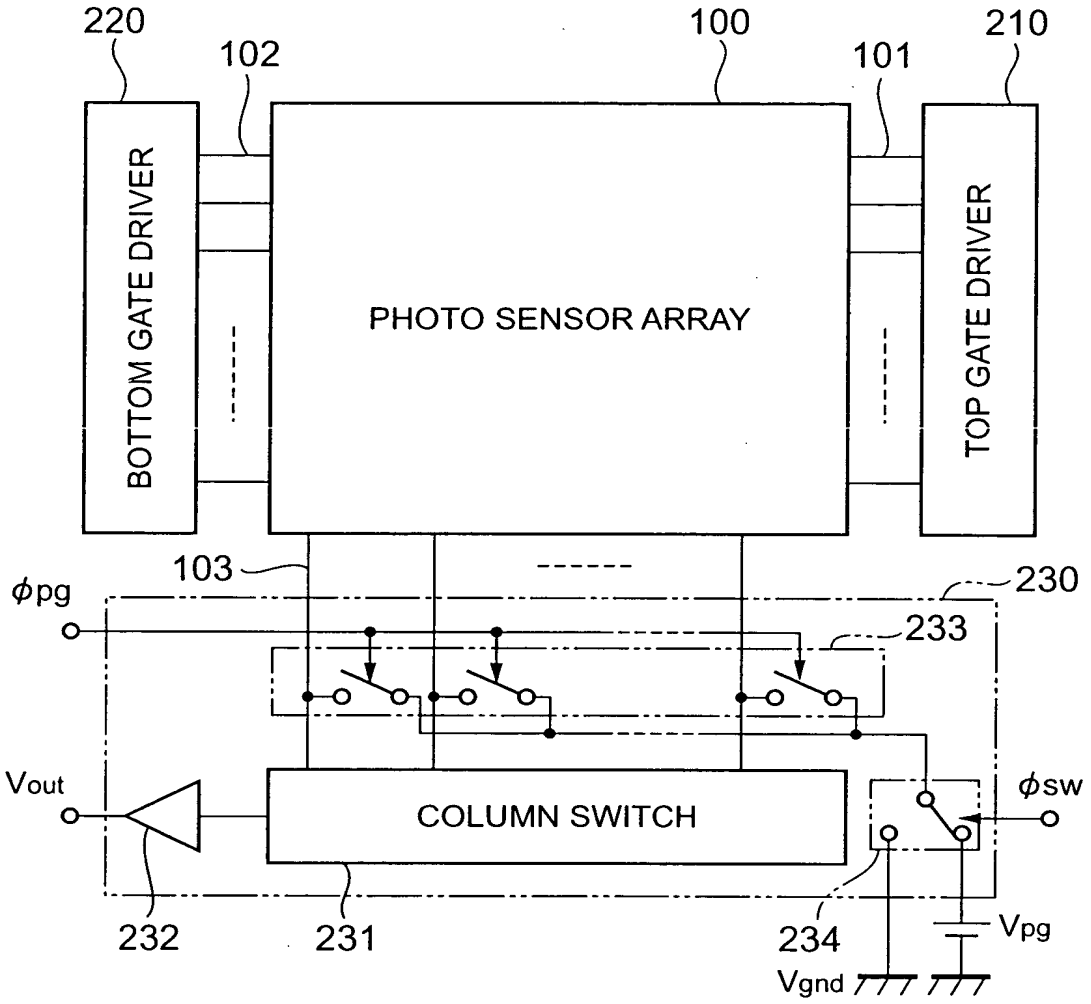


FIG.13B

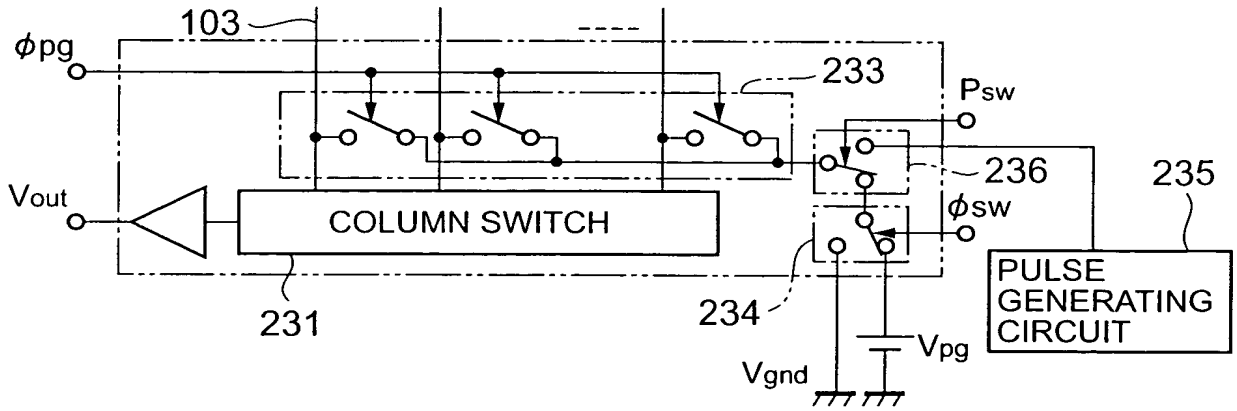


FIG.14

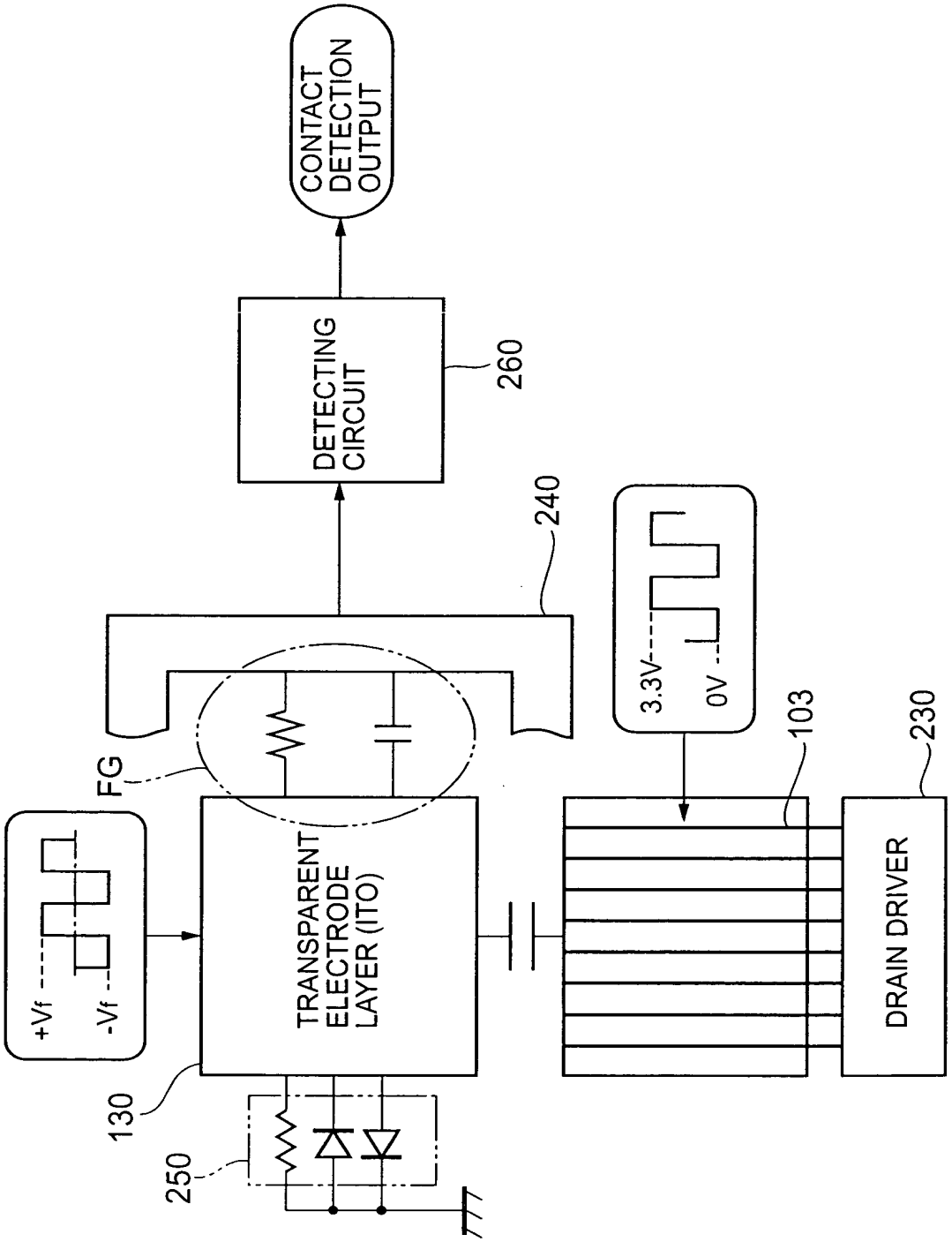

CONTACT DETECTION OUTPUT
DETECTING CIRCUIT
260
240
3.3V
0V
103
230
FG
+Vf
-Vf
TRANSPARENT ELECTRODE LAYER (ITO)
DRAIN DRIVER
130
250

FIG. 15

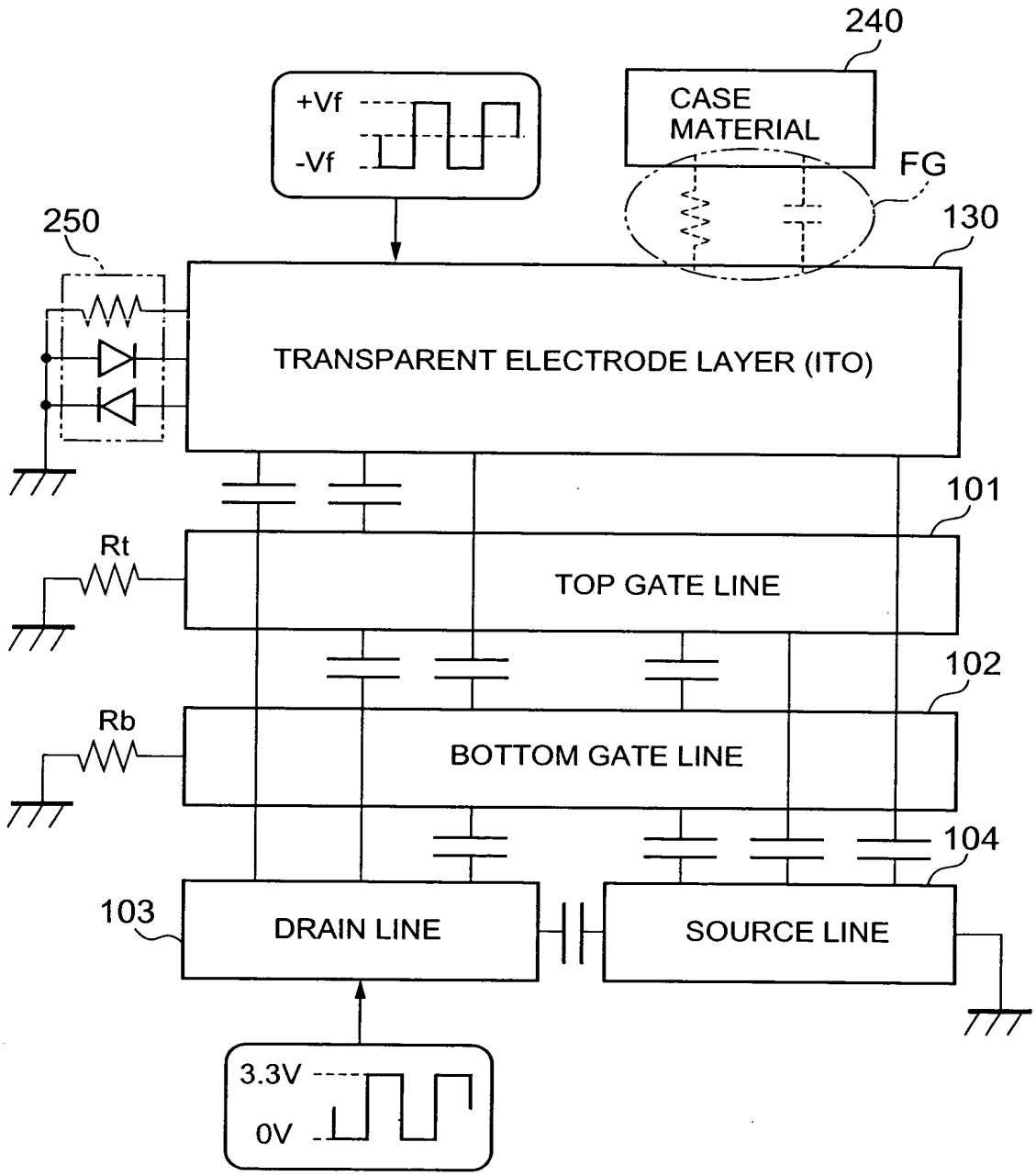

240
CASE MATERIAL
+Vf
-Vf
FG
250
130
TRANSPARENT ELECTRODE LAYER (ITO)
101
Rt
TOP GATE LINE
102
Rb
BOTTOM GATE LINE
104
103
DRAIN LINE
SOURCE LINE
3.3V
0V

FIG. 16A

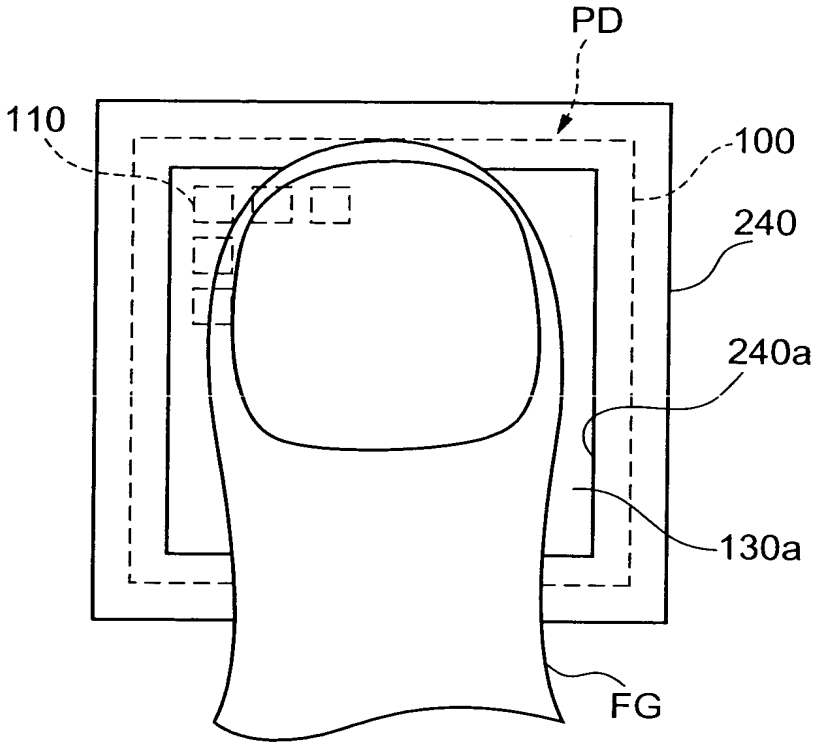


FIG. 16B

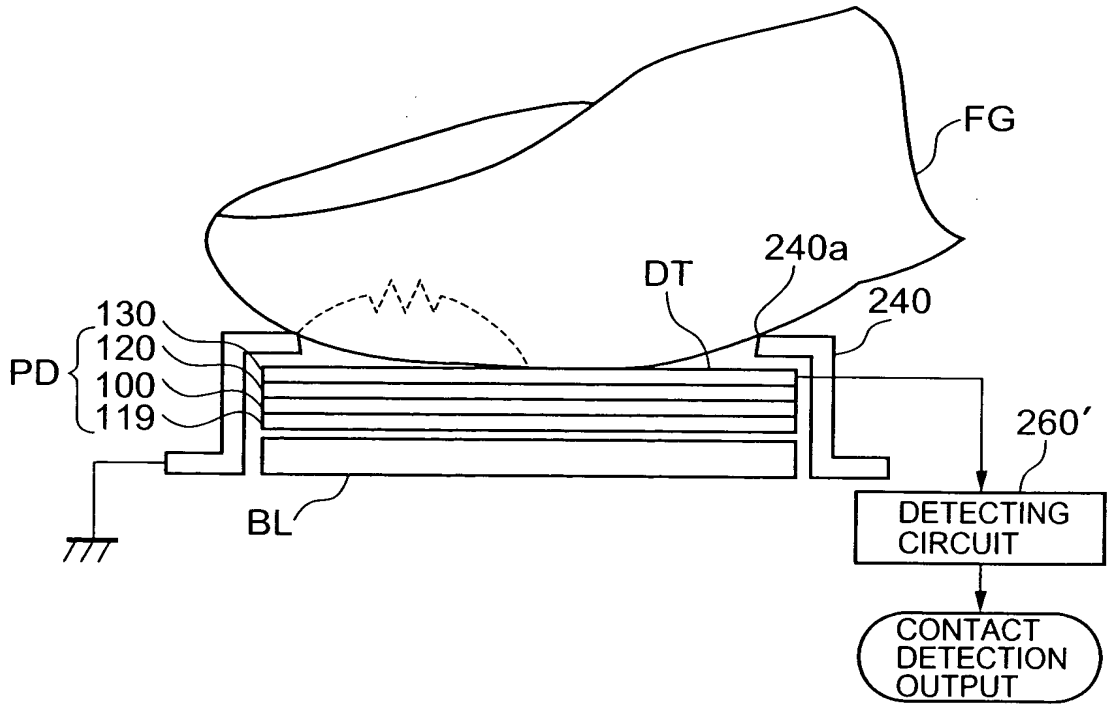


FIG. 17

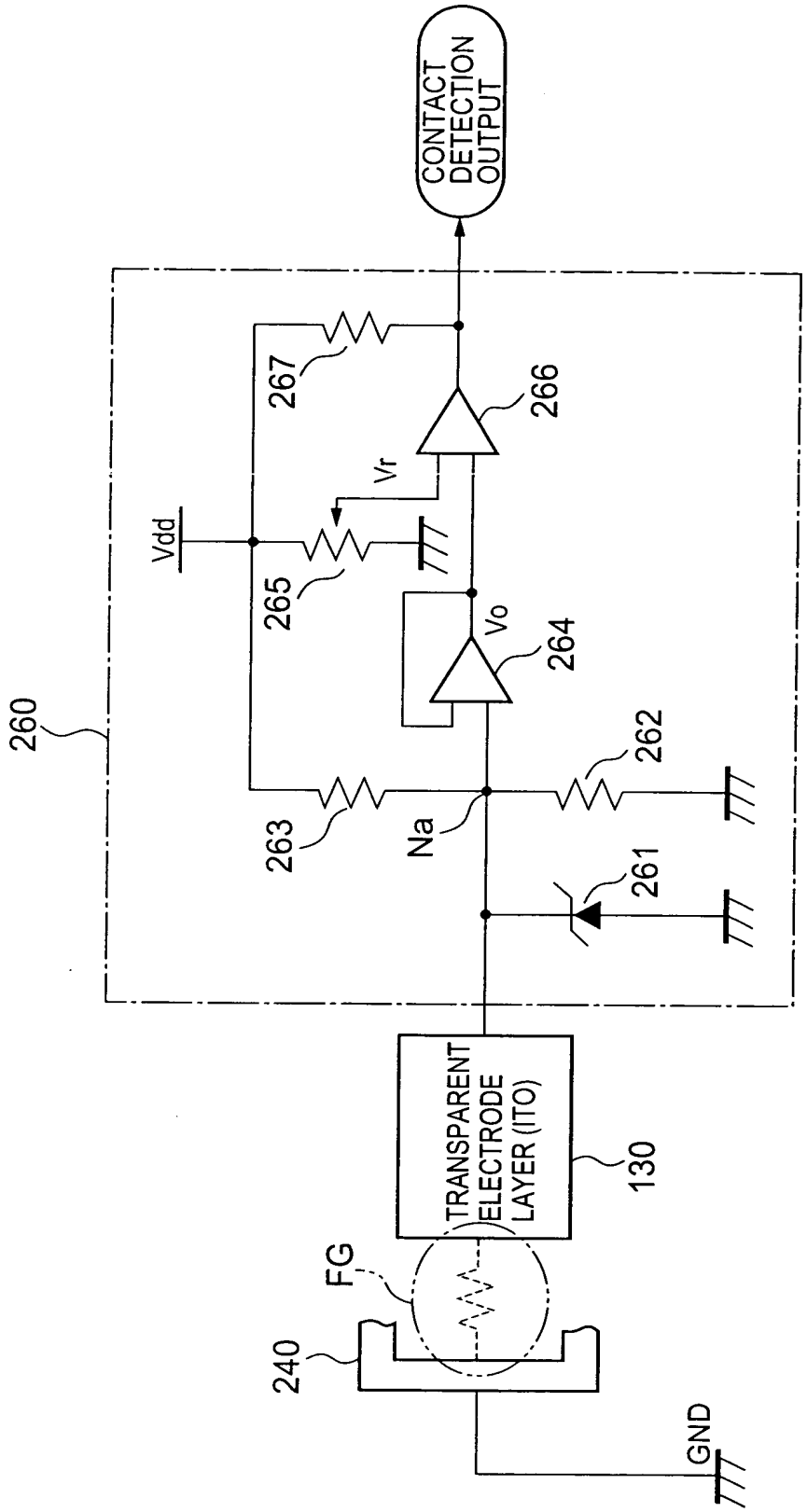

CONTACT DETECTION OUTPUT
260
267
266
Vr
Vdd
265
Vo
264
262
263
Na
261
TRANSPARENT ELECTRODE LAYER (ITO)
130
FG
240
GND

FIG. 18

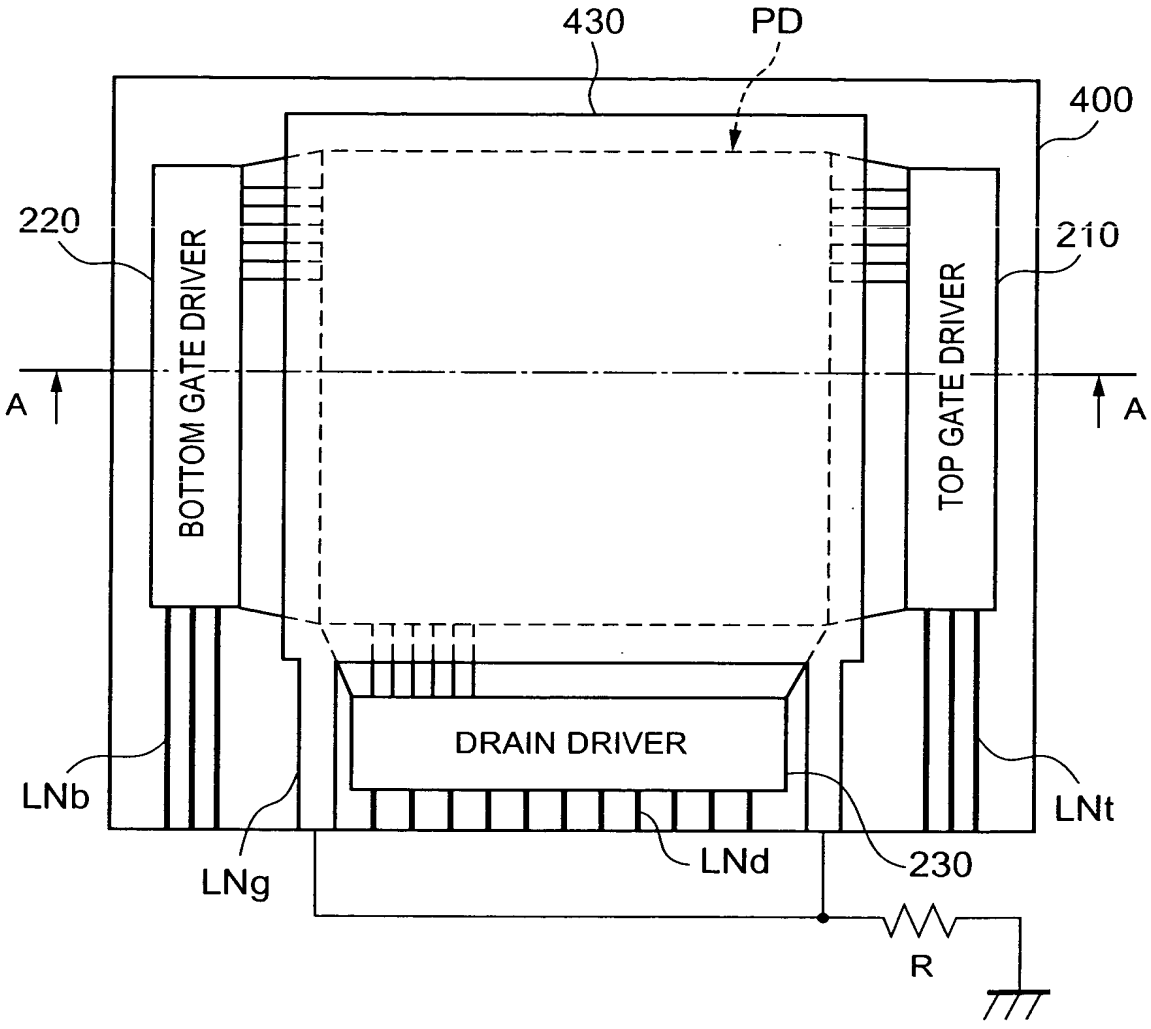
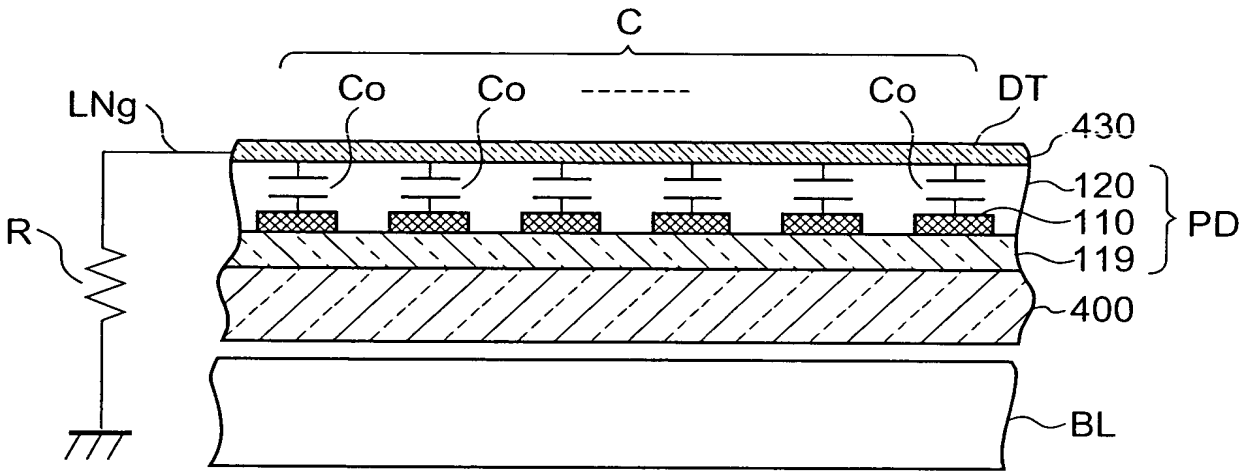

430
PD
400
220
210
BOTTOM GATE DRIVER
TOP GATE DRIVER
A
A
DRAIN DRIVER
LNb
LNg
LNd
230
LNt
R

FIG. 19



A-A PARTIAL CROSS SECTION

FIG. 20A

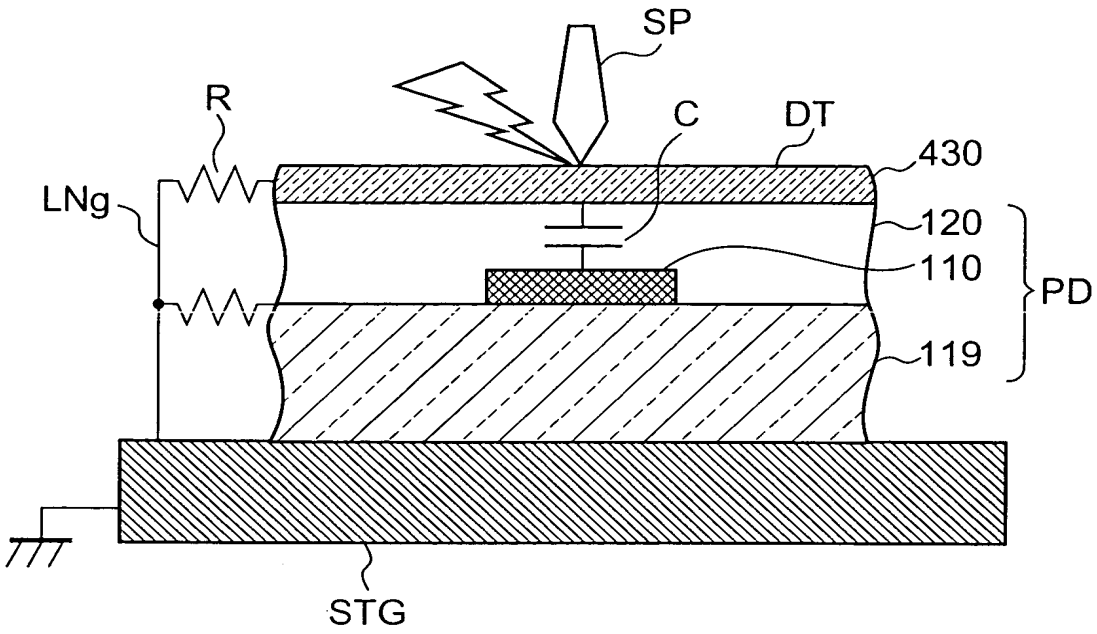


FIG. 20B

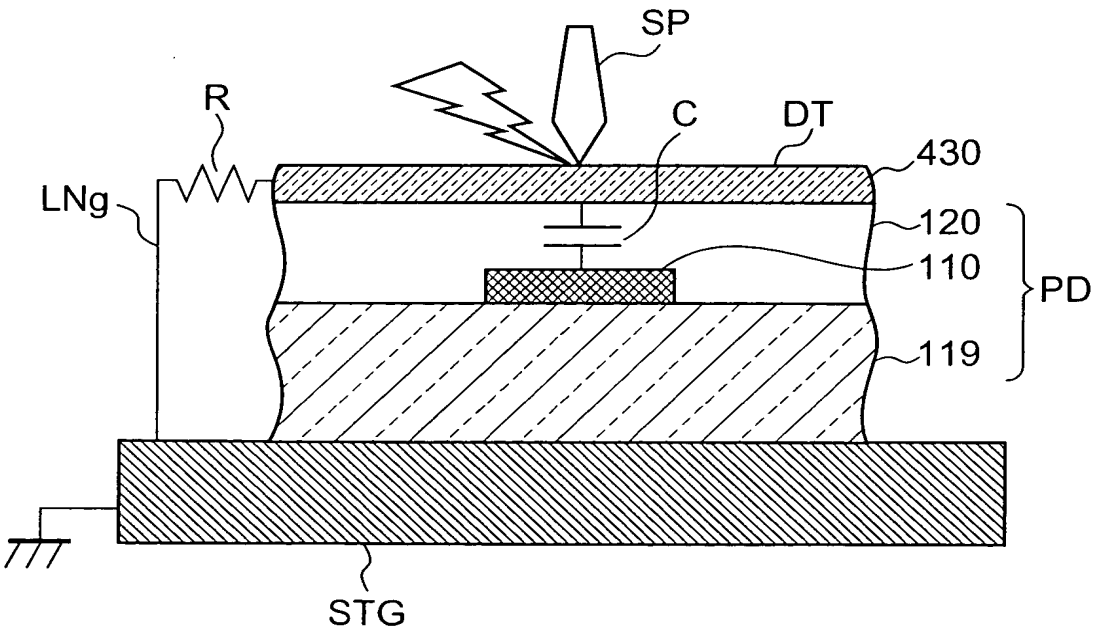


FIG. 21

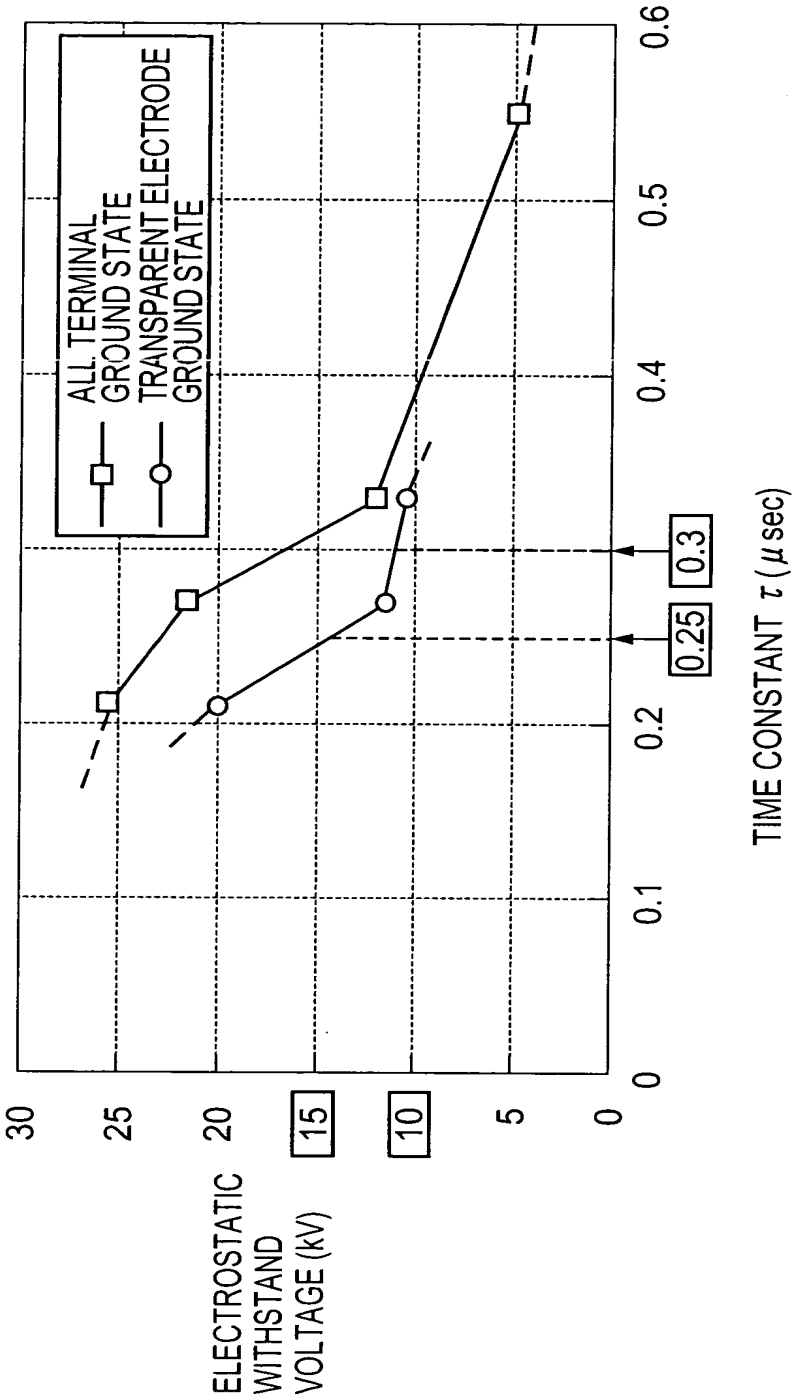

ALL TERMINAL GROUND STATE
TRANSPARENT ELECTRODE GROUND STATE
ELECTROSTATIC WITHSTAND VOLTAGE (kV)
30
25
20
15
10
5
0
0
0.1
0.2
0.25
0.3
0.4
0.5
0.6
TIME CONSTANT τ (μsec)

FIG. 22

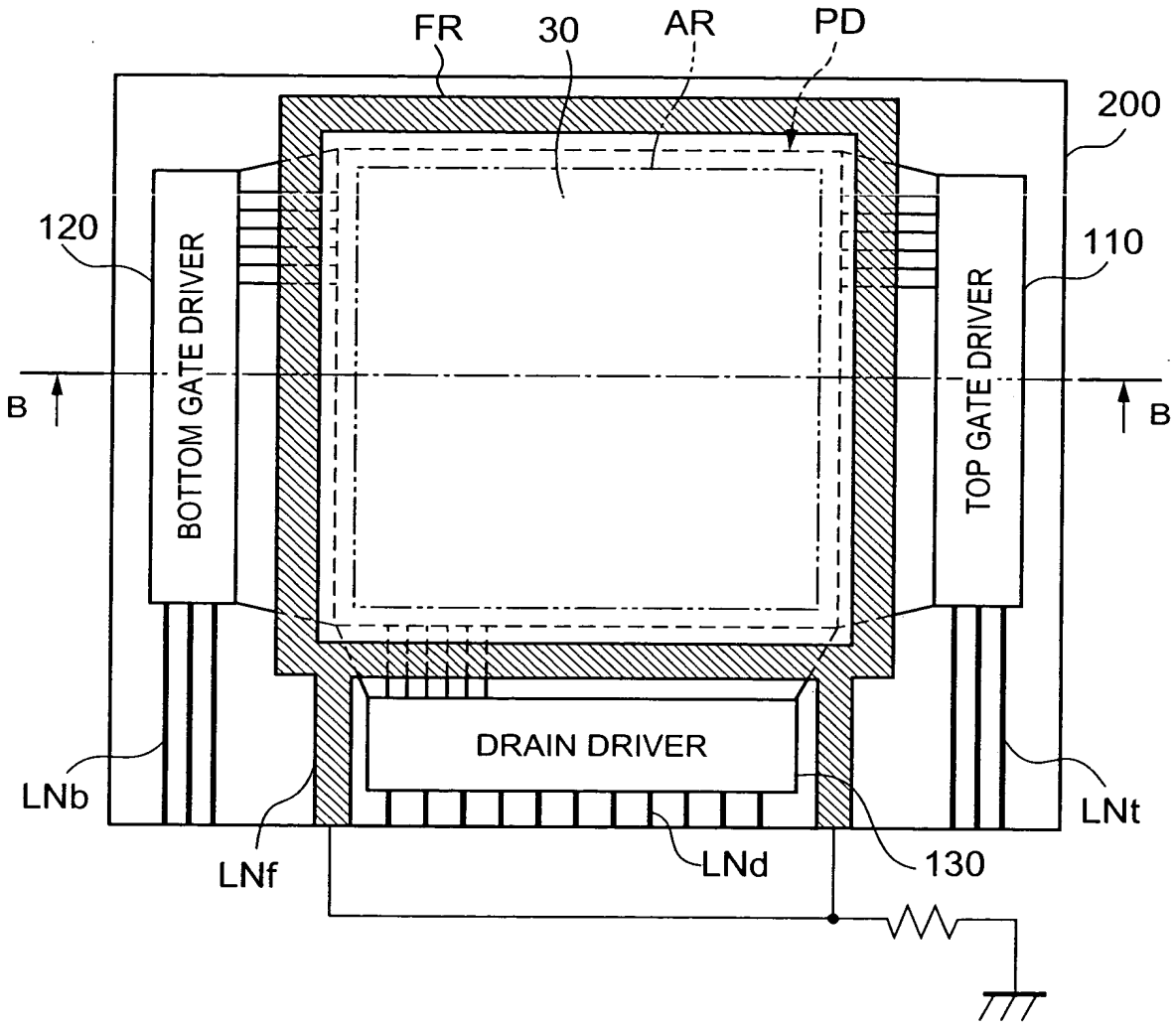
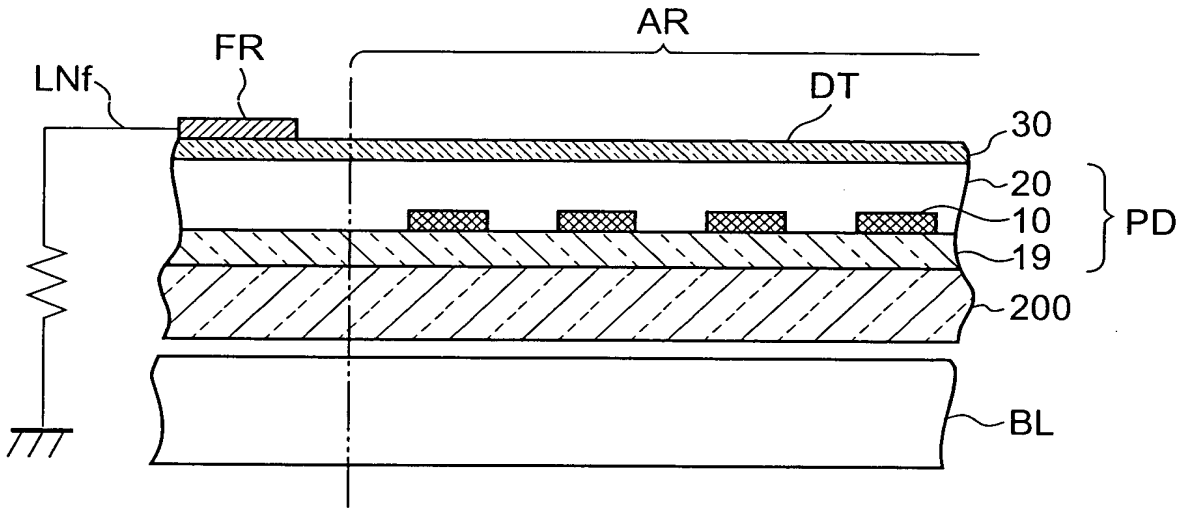

FR
30
AR
PD
200
120
110
BOTTOM GATE DRIVER
TOP GATE DRIVER
B
B
DRAIN DRIVER
LNb
LNf
LNd
130
LNt

FIG. 23



B-B PARTIAL CROSS SECTION

FIG. 24A

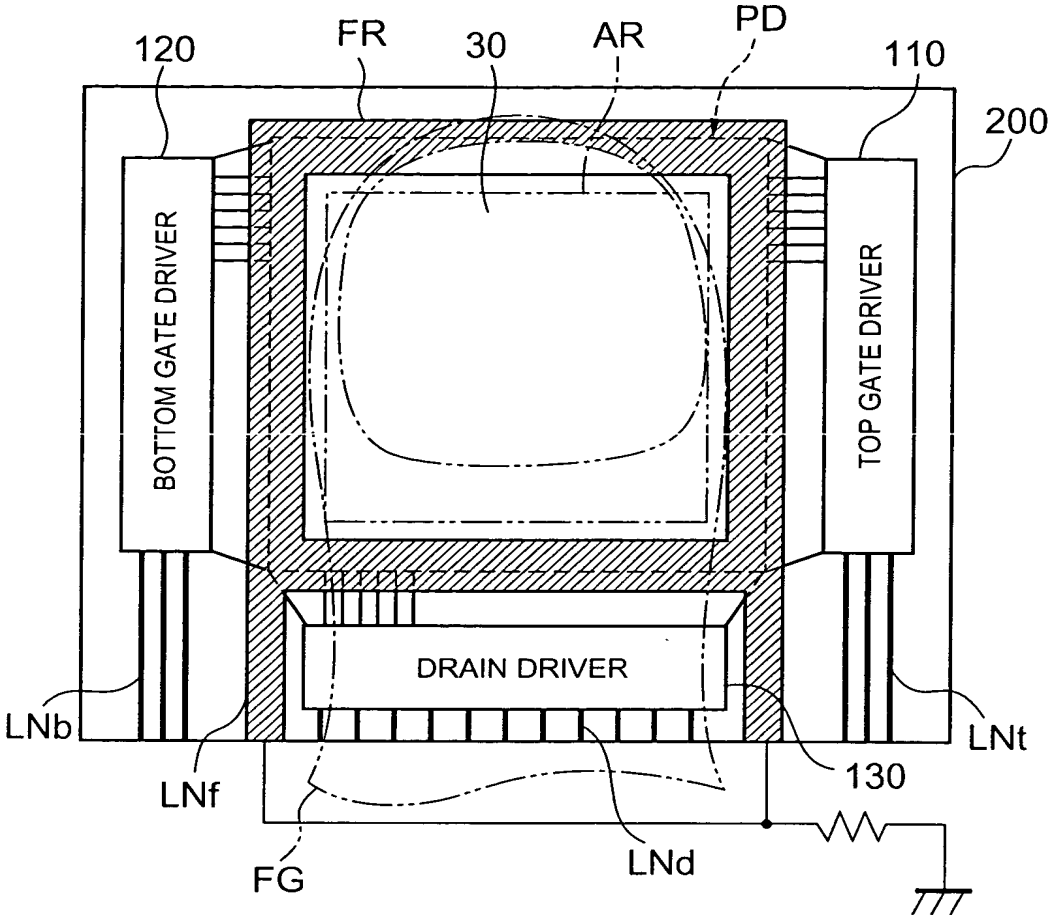


FIG. 24B

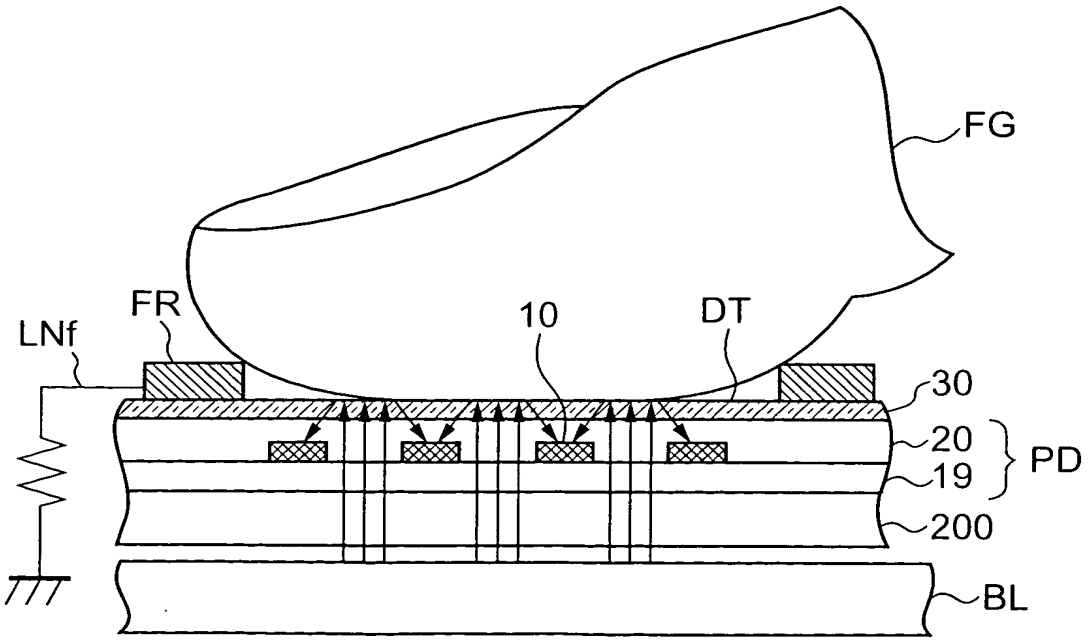


FIG. 25 PRIOR ART

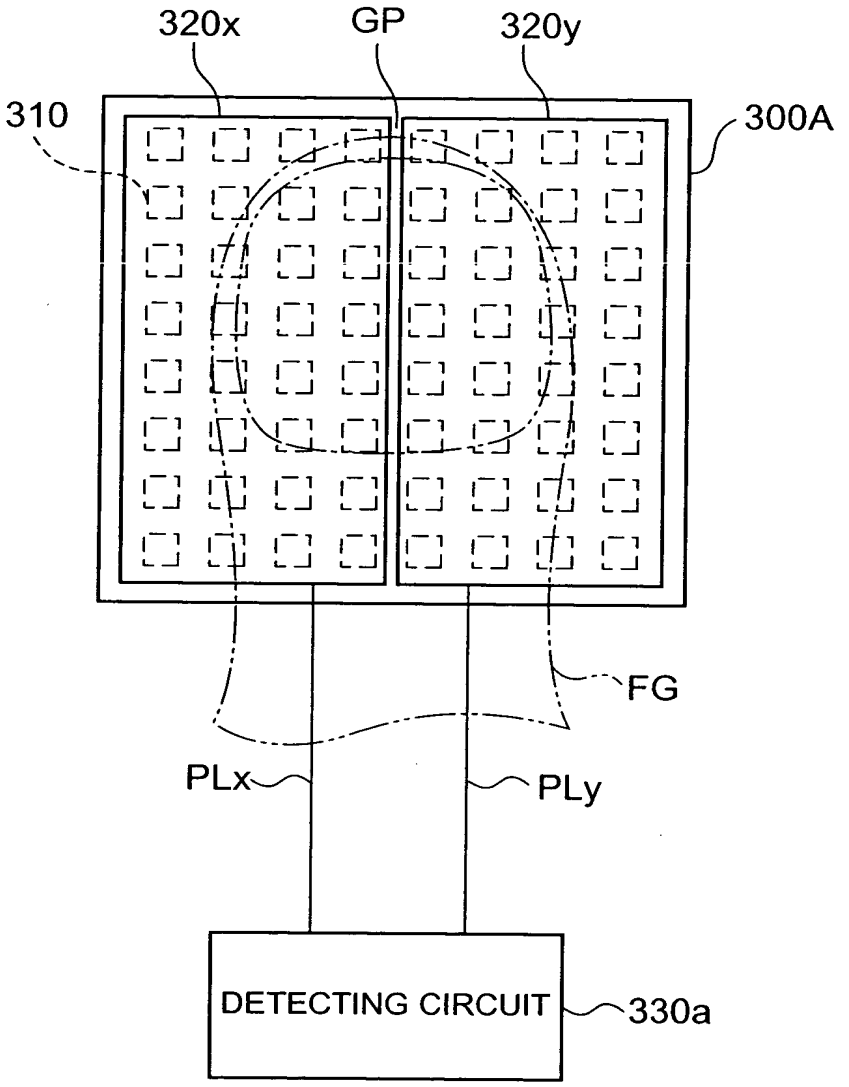


FIG. 26 PRIOR ART

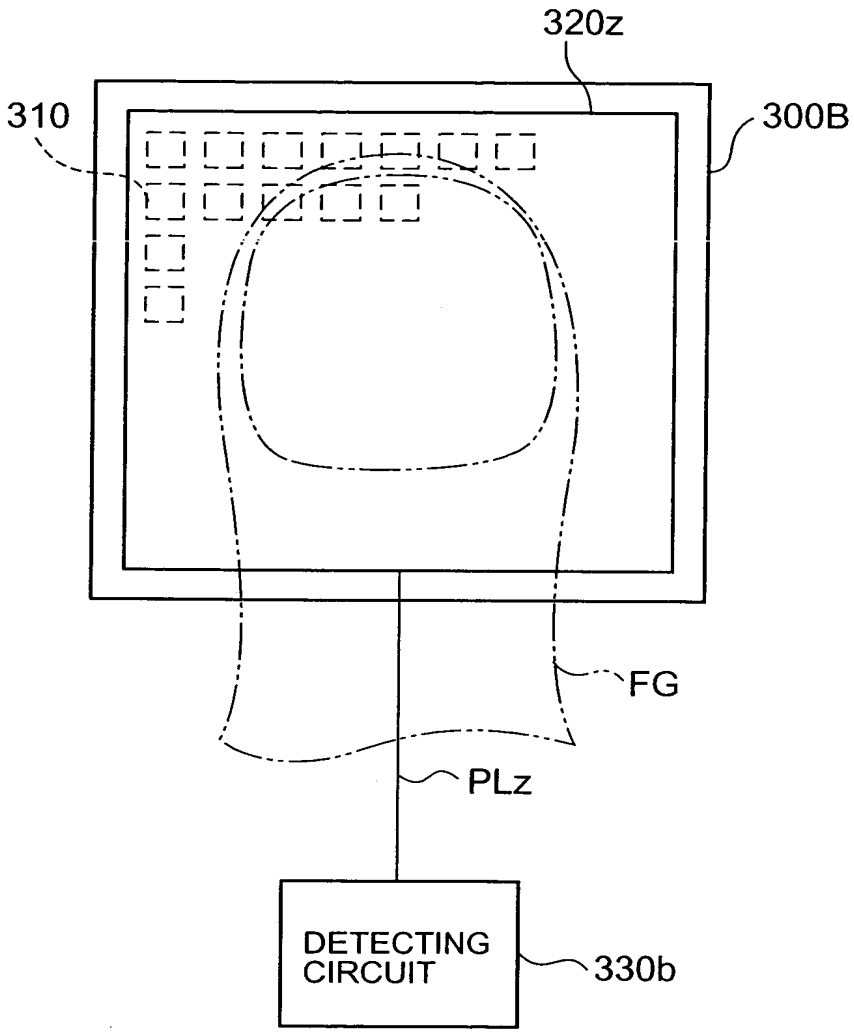


FIG. 27A PRIOR ART

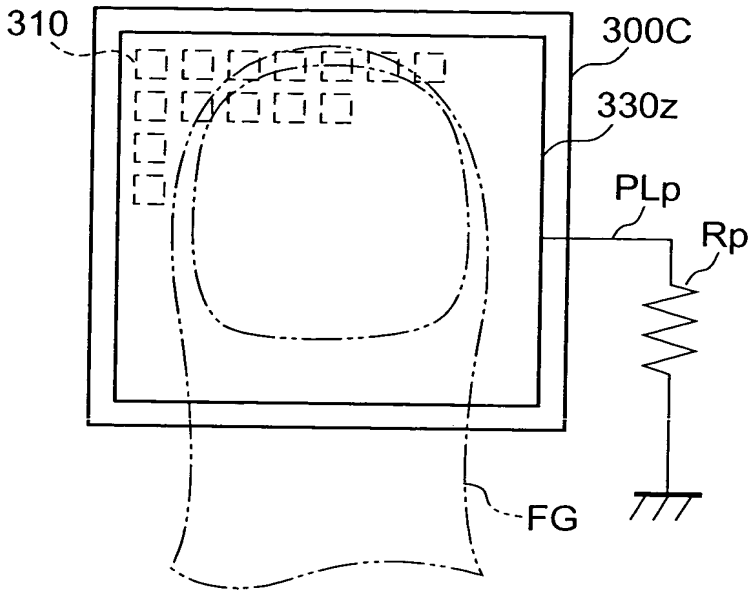
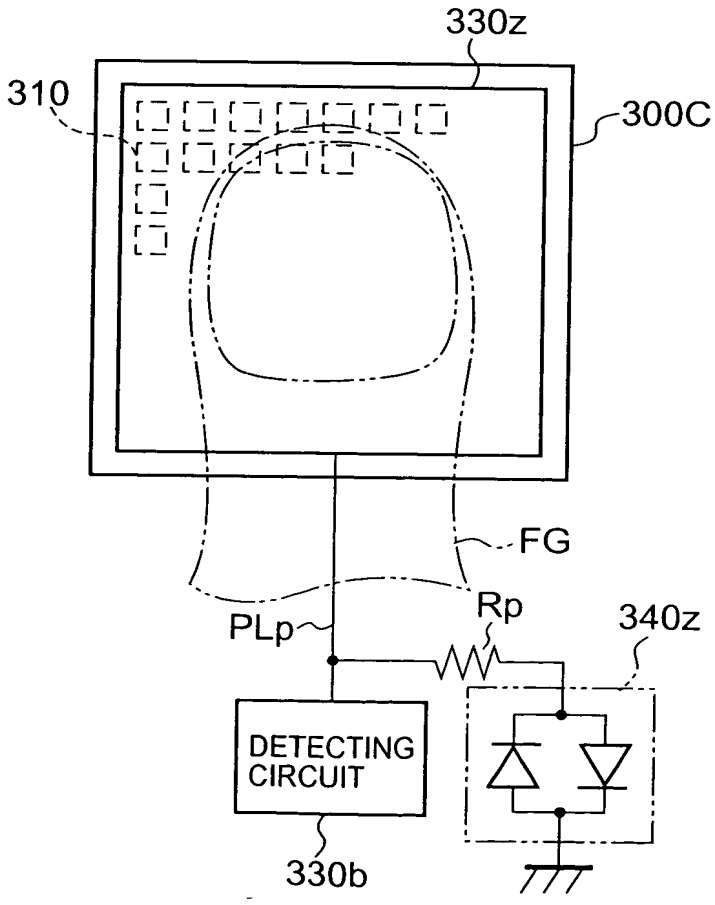



FIG. 27B PRIOR ART